Pernter gives the observers' descriptions and sketches of the three great classical halo displays: The Rome display of 1630, the Danzig display of 1661, and the St. Petersburg display of 1794. The last named, in particular, included a somewhat more prolific display of arcs (some of them inaccurately recorded), but only the Rome display included, doubtfully, parhelia of the 46° halo. None of these displays included a sun pillar. Several other relatively complete displays, accounts of which I have seen, have included certain arcs or mock-suns other than those here described. (See, e. g., MONTHLY WEATHER REVIEW, 48: 330–331, 1920.) The Ottawa display appears, however, to have been one of the few with a definite sun pillar. The distinction is explained by the fact that the pillar is seldom seen when the sun is more than a few degrees above the horizon, whereas most of the other phenomena are best seen when the sun is high. The pillar, which, with the horizontal circle, formed a cross through the sun, was a striking feature of the Ottawa display.

Curiously enough, the sun pillar, although it may be seen dozens of times a year at sunrise or sunset, has never been satisfactorily explained. Minnaert [2] sums up such explanations as have been put forward, and challenges the reader to complete the solution.

It is clear that a pillar formed with a solar altitude of about 25° cannot possibly be explained by the supposition of reflection from ice plates oscillating only slightly from a predominantly horizontal position. My own observations suggest that a distinct pillar is usually observed, other conditions permitting, when there is a steady wind, evident either from its local effect or from cloud forms, blowing approximately at right angles to the line connecting the sun and the observer. Such a wind might cause a preponderance of long hexagonal ice prisms to lie with their axes of symmetry horizontal and in the direction of the wind. This effect could produce a distinct pillar with high solar altitudes. It may well have been the explanation in the case under discussion, for the presence of the parhelia of the large halo proves that there was at times a preponderance of crystals with their 90° refracting edges vertical. Moreover, the wind at ground level was blowing steadily from the southeast; and, since the barometer was falling steadily, the same direction probably prevailed at high altitudes.

A complication arises from the brilliance of the large halo. The fact that it was considerably brighter than the small ring during the height of the display indicates an abundance of platelike crystals to account for refraction through the 90° faces outweighing that through the 60° faces of the randomly arranged crystals. It is doubtful whether such forms could have been predominantly oriented in the position required to give rise to either mock-suns or pillar. Possibly the explanation lies in the umbrella-shaped crystals that give rise to the mock-suns of the small halo. Such forms might lie with their principal axes horizontal in a strong wind and yet refract predominantly through their 90° faces. An alternative explanation is suggested by the occasional observation of a vague lattice structure in the cirro-nebula, which suggests that there were actually two distinct layers of cloud involved. Possibly there were different crystals forms and even different directions of movement in the two sheets.

It was hoped that some upper-air observations might be obtainable for the time of this display; but the clouds were far above the levels commonly utilized in commercial aviation, and no pertinent information was available. I have, however, to thank Mr. Jefferson, of Trans-Canada Air Lines, for his offer to make balloon observations, should future displays warrant the attempt.

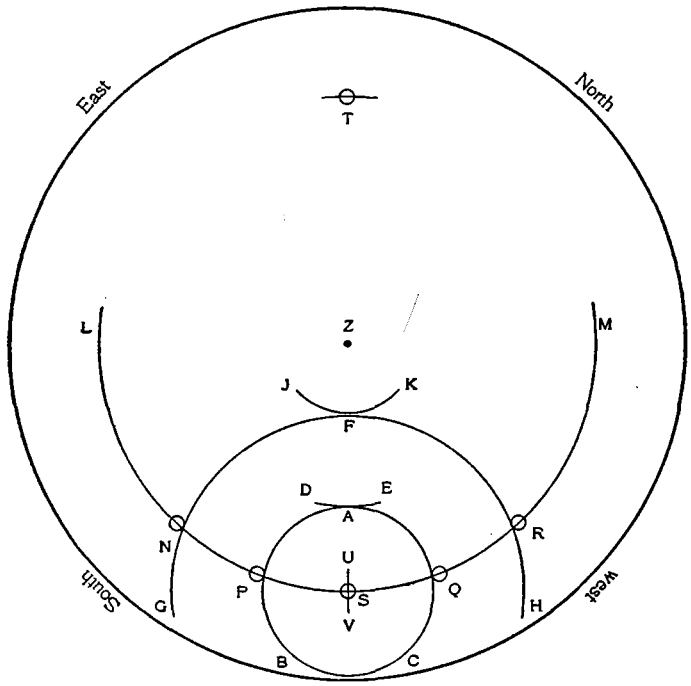

FIGURE 1.

[2] Minnaert, M. *Light and Colour in the Open Air.* London, 1940. *Cf.* MONTHLY WEATHER REVIEW, 63: 57–58, 1935.

AEROLOGICAL NORMAL DATA

Monthly tables, showing normal values of temperature and relative humidity for standard levels up to 5 kilometers, were recently printed by the Weather Bureau. These tables include all available kite, airplane, and radiosonde records for the United States as well as for St. Thomas, V. I., Coco Solo, C. Z., and Pearl Harbor, T. H., through June 1939.

A limited supply of these tables are available for distribution and may be secured by applying to the Chief, United States Weather Bureau, Washington, D. C.